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EXAMINER				
ANGEBRANDT, MARTIN J				
ART UNIT		PAPER NUMBER		
1795				
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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

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Office Action Summary

Application No.

10/563,815

Applicant(s)

MIZUSHIMA, TETSURO

Examiner

Martin J. Angebrandt

Art Unit

1795

Period for Reply -- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 11/19/09 & 9/30/09.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1.4.6-8 and 10-16 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1.4.6-8 and 10-16 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☐ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO/SB-06)
Paper No(s)/Mail Date 11/18/09
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date _____
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: _____

1. The response of the applicant has been read and given careful consideration. Responses to the arguments are presented after the first rejection to which they are directed
2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

3. Claims 1,4,6-8,10,12-14 and 16 are rejected under 35 U.S.C. 103(a) as being unpatentable over Chandross et al. EP 938027, in view of Loy, et al., "Substituent effect on the sol-gel chemistry of organotrialkoxysilanes", Chem. Mater., Vol. 12(12) pp. 3624-3632 (2000), Shustack et al. '566 and Hiruma et al., '831.

Chandross et al. EP 938027 teaches in example 1, the matrix precursor comprising methyltriethoxysilane and phenyltriethoxysilane combined with 10 wt % lauryl acrylate and photoinitiator CGI-784 and hydrolyzed to form the a holographic recording medium and coated to the thickness of 300 microns. This was used in example 3 to record a holograms [0028-0034]. The matrix precursor is $R_n(M)(OR')_{4-n}$ where R is aryl or alkyl, R' is lower alkyl, n is 1 or 2 and M is Si, Ti, Ge, Zr, V or Al and is hydrolyzed to form the form the matrix. [0009,0014-0018,0022-0025]. Organic moieties are disclosed as increasing compatibility with the photopolymer and the free volume/porosity. [0011]. The use of various monomers including isobornyl acrylate, phenoxyethyl acrylate [0019]. The use of organoalkoxysilanes, and particularly trialkoxysilanes is disclosed [0022].

Loy, et al., "Substituent effect on the sol-gel chemistry of organotrialkoxysilanes", Chem. Mater., Vol. 12(12) pp. 3624-3632 (2000) teaches the formation of organic/inorganic materials/xerogels/matrices. $R(M)(OR')_3$, where R' is methyl or ethyl and R is hydrogen, methyl, ethyl, propyl, butyl, isobutyl, t-butyl, hexyl, octyl, decyl, dodecyl, hexadecyl, octyl, octadecyl, cyclohexyl, vinyl, phenyl, benzyl, phenethyl, chloromethyl, p-chloromethylphenyl or tridecafluoro-1,1,2,2-tetrahydrooctyl (page 3624). The chloromethyl and chloromethylphenyl are shown to react more slowly than the methyl in table 5. (page 3628). The pore diameters for the chloromethyl is significantly larger than that for the methyl substituted silane as shown in tables 7 and 8 (page 3631). The hydrogen, methyl and chloromethyl gels were the most transparent (page 3631, right column). The formation of gels using materials usually used as coupling agents is disclosed (page 3632, left column)

Shustack et al. '566 teaches organometallic coupling agents such as (bromophenyl)trimethoxysilane and (chlorophenyl)trimethoxysilane lowers scattering losses. [0025].

Hiruma et al., '831 teaches coupling agents increase the adhesion between photocurable coatings and the underlying substrate. Useful coupling agents include chloropropyl trimethoxysilane (3/61-4/66).

It would have been obvious to one skilled in the art to modify the examples of Chandross et al. EP 938027 by replacing the methyltriethoxysilane with chloromethyltriethoxysilane as taught by Loy, et al., "Substituent effect on the sol-gel chemistry of organotrialkoxysilanes", Chem. Mater., Vol. 12(12) pp. 3624-3632 (2000) with a reasonable expectation of forming useful organic-inorganic matrix holographic recording medium, based upon the transparency

disclosed by Loy, et al., "Substituent effect on the sol-gel chemistry of organotrialkoxysilanes", Chem. Mater., Vol. 12(12) pp. 3624-3632 (2000) with increase compatibility with the organic matrix based upon the teaching of the coupling functionality of chlorinated alkyl/aryl trialkoxysilanes by Shustack et al. '566 and Hiruma et al., '831 and to use other disclosed monomers, such as the phenoxyethyl acrylate in place of at least part of the lauryl acrylate used based upon the disclosed equivalence at [0019] of Chandross et al. EP 938027.

The showing of the instant specification is limited to the use of mixtures of TEOS and the inventive composition in a particular ratio, acid cured and with the high refractive index monomers used. The claims are quite a bit broader than this. Further it is known from Loy, et al., "Substituent effect on the sol-gel chemistry of organotrialkoxysilanes", Chem. Mater., Vol. 12(12) pp. 3624-3632 (2000) that The hydrogen, methyl and chloromethyl gels were the most transparent and from Chandross et al. EP 938027 that the presence of the $R_n(M)(OR')_{4-n}$ where R is alkyl or aryl yield matrices which are more organic compatible. The examples of the instant specification in using a mixture of TEOS and the inventive silane has clearly reduced the organic character of the matrix and therefore its compatibility with the photopolymer.

The applicant is correct that no one of the references teach the invention claimed, but this position fails to account for the fact that the rejection relies upon several references. As the matrix which forms a substantial portion of the composition is more transparent, as discussed in Loy et al. it is reasonable to expect that the modification of using the chloromethyl or chloromethylphenyl containing would confer at least some increased transparency to the holographic article which would be desirable. Further the reduced scattering discussed by Shustack is clearly a benefit which relates to the performance of the holographic media as noted

on page 7 of the response in the first paragraph. As the light passes through the hologram and it is an optical article, transparency is clearly a desirable attribute and no specific direction in Chandross et al. need be present for one of ordinary skill in the art to appreciate this, but Chandross does discuss that the cured samples in example 1 are "transparent" and indicates that this is a desirable property. The applicant argues that there is no motivation to reduce scatter. The discussion of low levels of bubbles and other internal imperfections in examples I addresses this as these would clearly result in scattering of light and one of ordinary skill in the art would recognize that light which is scattered is not able to be diffracted to form the holographic image. The issue of adhesion to an underlying substrate is also clear for one of ordinary skill in the art, noting that the holographic recording composition is provided between two substrates in Chandross et al. The applicant argues that they have shown an increased compatibility between the cured matrix of the invention and the photocurable components. The examiner notes that only one photosensitive composition has been used which is a mixture of phenoxyethyl acrylate, 2,2-bis(4-acryloxy-diethoxy)phenyl]propane and irgacure 784. This is not a showing of sufficient breadth for the coverage sought, noting all the free radically polymerizable monomers listed at [0043] of the prepub and the cationically curable monomers discussed at [0048-0051]. The showing of only for a combination of two free radically polymerizable monomers. For the scope of coverage sought, more data would have to be of record. With respect to separation, perhaps the issue of adhesion discussed by Hiruma et al. plays a part. The rejection stands.

The position articulated by the applicant argues that the references of the prior art applied by the examiner fail to address the compatibility between the monomer and the sol-gel matrix which results in reduced scattering (whiteness) and increased transparency. The application

points to comparative example 2 of the instant specification and argues that this is a good comparison with the prior art. With respect to the data of comparative example 2, the resultant hologram is described as cloudy (bubbles/phase separation) and having a low dynamic range (i.e. unable to record multiple holograms). Example 3 of Chandross et al. EP 938027 is not described as suffering from these defects and record multiple hologram using shift multiplex recording at [0028,0033]. It is not tenable to argue that the comparative example is equivalent to one with the prior art when their performance is so divergent. It may be that the showing is limited to the monomer used, noting that lauryl acrylate (a low refractive index monomer) is used by Chandross et al. EP 938027 and phenoxyethyl acrylate (a high refractive index monomer) is used in the examples of the instant specification as it may be that the difference between the refractive index of the monomer and the matrix is more of an issue (cause of whiteness) than phase separation. The examiner also notes that the **methyltriethoxysilane** and phenyltriethoxysilane are used in a 1:1 ratio in Chandross, not the 2:1 **tetraethoxysilane** and phenyltriethoxysilane of the comparative example. It is not clear what the effect of the change of the **methyltriethoxysilane** (alkyltrialkoxysilane) for **tetraethoxysilane** (tetraalkoxysilane) or the ratio of these with phenyltriethoxysilane might have. The position of the applicant also fails to appreciate that in acting as a coupling agent with surfaces and photopolymer compositions, there is a reasonable expectation that the halogenated would reduce phase separation based upon the teachings of Hiruma et al.. There is through the issue of a large difference between the monomer and the resulting cured sol-gel matrix causing refractive index dislocation, but this is discussed by Shustack et al. which discussed lower scattering (whiteness) due to the presence of the halogenated sol-gel species.

The applicant's analysis in the arguments of the comparative examples serves to illustrate the examiner's position that the example of Chandross et al. EP 938027 the matrix precursor comprising methyltriethoxysilane and phenyltriethoxysilane combined with 10 wt % lauryl acrylate and photoinitiator CGI-784, and **does not include TEOS (tetraethoxysilane)**. When the Chandross et al. EP 938027 matrix is cured, phenyl and methyl groups remain as part of the matrix., this is not the case with TEOS, where the ethoxy moieties all are removed. Chandross et al. EP 938027 specifically describes these organic moieties as improving the compatibility of the matrix precursor and the organic components and the use of the phenyl lowers the network density, which aids in monomer diffusion. [0011]. This speaks directly to the comparative examines and their compatibility and so the benefit argued is already recognized in the art. **The applicant could move away from the teachings of Chandross et al. EP 938027 by requiring m for the metal alkoxide with no halogenated group to be 0.** Currently it can be 1 or 2, which as recognized by Chandross provides means for improving the compatibility. The teachings of Shustack et al. '566 and Hiruma et al., '831 relate to the haloalkyltrialkoxides being known as coupling agents and serving to bond the inorganic sol-gel to various substrates including polymeric substrates. This speaks to the compatibility of in the cured state between the inorganic and organic components of the matrix. The larger pores discussed by Loy is a desired trait in the cured matrix as this promotes monomer migration/diffusion as discussed in Chandross. The rejection stands.

4. Claims 1,4,6-8,10 and 12-16 are rejected under 35 U.S.C. 103(a) as being unpatentable over Chandross et al. EP 938027, in view of Loy, et al., "Substituent effect on the sol-gel

chemistry of organotriakoxysilanes”, Chem. Mater., Vol. 1212) pp. 3624-36-32 (2000), Shustack et al. ‘566 and Hiruma et al., ‘831 further in view of Otaki et al. ‘740.

Otaki et al. teaches the holographic recording medium with an inorganic-organic matrix. The photoreactive monomer may be used in amounts of 10-1000 part to 100 parts of the organic-inorganic polymer, preferably 10-100 parts per 100 parts. [0090]

To address other embodiments bounded by the claims, but not rendered obvious above, the examiner cites Otaki et al. ‘740 and holds that it would have been obvious to modify the media rendered obvious by the combination of Chandross et al. EP 938027, Loy, et al., “Substituent effect on the sol-gel chemistry of organotriakoxysilanes”, Chem. Mater., Vol. 1212) pp. 3624-36-32 (2000), Shustack et al. ‘566 and Hiruma et al., ‘831 by using a higher relative amount of monomer, such as 50-1000 parts per 100 parts of matrix with a reasonable expectation of successfully forming a useful holographic recording medium based upon the teachings of Otaki et al. ‘740.

The rejection stands for the reasons provided above as no further arguments are raised by the applicant.

5. Claims 1,4,6-8 and 10-16 are rejected under 35 U.S.C. 103(a) as being unpatentable over Chandross et al. EP 938027, in view of Loy, et al., “Substituent effect on the sol-gel chemistry of organotriakoxysilanes”, Chem. Mater., Vol. 1212) pp. 3624-36-32 (2000), Shustack et al. ‘566, Hiruma et al., ‘831 and Otaki et al. ‘740, further in view of Poutasse et al. “782 or Zeldin et al. ‘172.

Poutasse et al. “782 teaches silanes which act as adhesion promoters (silane coupling agents) bounded by formula B including 8-bromooctyl trimethoxy silane, bromophenyl

trimethoxy silane, 3-bromopropyl trimethoxysilane, 2-chloroethyl triethoxy silane, p-chloromethylphenyl trimethoxy silane, chloromethyl triethoxy silane, 3-chloropropyl triethoxy silane and iodopropyl trimethoxy silane (6/32-7/57).

Zeldin et al. '172 teaches various silane coupling agents including bromoethyltriethoxy silane, chloroethyltriethoxy silane, bromopropyltriethoxy silane, bromopropyltrimethoxy silane, bromomethyl triethoxysilane, and the like (3/2-57).

In addition to the basis above, it would have been obvious to modify the media rendered obvious by the combination of Chandross et al. EP 938027, Loy, et al., "Substituent effect on the sol-gel chemistry of organotrialkoxysilanes", Chem. Mater., Vol. 12(12) pp. 3624-3632 (2000), Shustack et al. '566, Hiruma et al., '831 and Otaki et al. '740 by using other silane coupling agents, such as those bounded by formula B and/or taught by Poutasse et al. '782 or those used by Zeldin et al. '172, in place of the chloromethyl trialkoxides exemplified by Loy, et al., "Substituent effect on the sol-gel chemistry of organotrialkoxysilanes", Chem. Mater., Vol. 12(12) pp. 3624-3632 (2000), Shustack et al. '566 and Hiruma et al., '831 with a reasonable expectation of gaining the benefits disclosed in adhesion and the like based upon these being silane coupling agents/adhesion promoters.

The rejection stands for the reasons provided above as no further arguments are raised by the applicant.

6. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Martin J. Angebrannt whose telephone number is 571-272-1378. The examiner can normally be reached on Monday-Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Kelly Cynthia can be reached on 571-272-1526. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Martin J Angebranndt
Primary Examiner
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01/26/2010